BY THE ORDER OFTHE COMMANDER

FAIRCHILD AFB INSTRUCTION 21-019

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Maintenance

FUEL TANK/CELL CONFINED SPACE ENTRY TRAINING

COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

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This instruction provides guidance on Fuel Tank/Confined Space Entry, for all personnel working around Fuel Systems, and Fuel Systems Repair Emergency Response Plans and Procedures.

SUMMARY OF REVISIONS

This document is substantially revised and must be completely reviewed.

1. TRAINING OBJECTIVES

1.1. Informational Objectives. This training will inform personnel engaged in fuel tank/confined space entry and rescue/emergency evacuation in signs of vapor inhalation and fuel ingestion, safety requirements, responsibilities, hazards associated with fuel systems maintenance, operations of support equipment, rescue procedures, emergency notification of personnel and other organizations, and evacuation procedures.

1.2. Establishing a rescue team. This plan will establish a rescue team consisting of personnel to remove individual(s) incapable of self-rescue from fuel tanks/cells, when such removal is possible, and identify base or local emergency response agencies needed to provide immediate medical care and removal if not otherwise possible. This plan will account for all foreseeable rescue situations.

2. VAPOR INHALATION OR FUEL INGESTION SIGNS AND TREATMENT

2.1. Medical Symptoms. Personnel that inhale vapors, ingest fuel, or contact fuel may experience euphoria (poor judgment), nausea, dizziness, fatigue or drowsiness, unconsciousness (eventual death), dermatitis. See **Attachment 1** (Glossary of References and Supporting Information) for Definitions.

2.2. Treatment for personnel that experience above symptoms.

2.2.1. Immediately remove the individual from toxic atmosphere.

2.2.2. If on skin, wash fuel from affected area with mild soap and cool water. See a physician if a rash develops.

2.2.3. If ingested, do not induce vomiting, immediately report to the hospital or call 911 to report the emergency.

2.2.4. If fuel has been inhaled, immediately report to the hospital or call 911 to report the emergency.

2.2.5. If individual is not breathing, start artificial respiration. Call 911.

2.2.6. If individual has no pulse, immediately start CPR and call 911 to report the medical emergency.

2.2.7. If fuel is splashed into eyes, immediately and continuously flush with clean water and report to the hospital or call 911 to report the emergency. **NOTE:** To avoid the problems associated with jet fuel, follow technical data and use the protective equipment found in the fuel systems repair area.

3. SAFETY REQUIREMENTS

3.1. Minimal Personnel Required. A minimum of three personnel will be on hand prior to fuel tank/confined space entry. (May only be wavered if rescue can be done without the attendants' face breaking the plane of the opening).

3.2. Pre-requisites for Fuel Tank/Confined Space Entry. The following will be accomplished prior to entry:

3.2.1. A field permit will be issued prior to task starting.

3.2.2. Respirators for each individual will be available and utilized in the fuel tank/confined space.

3.2.3. All personnel will remove jewelry, watches, and spark/flame producing items, and smoking materials.

3.2.4. All personnel entering the repair area will ground themselves.

3.2.5. All footwear will be checked for tacks, staples, or exposed metal. Unserviceable footwear will be removed.

3.3. Clothing Authorized. Only white cotton coveralls or cotton sweat suits will be worn in the fuel tank/cells. All other clothing worn in the fuel repair area must be lint-free, clean, and serviceable. Shoe covers or tennis shoes will be worn in integral fuel tanks. No shoes will be allowed in fuel bladder cells.

3.4. Communication of Personnel. Communication between all personnel will be established prior to and maintained during fuel tank/confined space entry. It may be voice, tapping or any other pre-arranged method.

4. RESPONSIBILITIES OF VARIOUS INDIVIDUALS

4.1. Responsibilities of Entrants. All entrants must be qualified to enter into a fuel tank/confined space and meet the following requirements:

4.1.1. Self-Aid Buddy Care (SABC) certified.

4.1.2. Cardiopulmonary Resuscitation (CPR) certified.

4.1.3. Medically Qualified (Special purpose exam code "L").

4.1.4. Air Supplied Respirator certified IAW AFOSH Std 48-1.

4.1.5. Receive Hazardous Communication Training IAW AFOSH Std 161-21.

4.1.6. Receive Fuel Tank/Confined Space and Rescue/Emergency Training.

4.1.7. Shall adhere to all safety precautions and utilize all protective equipment required by BES and outlined in tech data or MSDS as interpreted by BES.

4.2. Responsibilities of Attendants . Attendants must be qualified in the same requirements as the entrants and:

4.2.1. Monitor activities inside and outside the fuel tank/cells for hazards.

4.2.2. Monitor entrant for signs of overexposure.

4.2.3. Limit entry to only those personnel listed in the Field Permit.

4.2.4. Evacuate all fuel tank/cells during emergency situations.

4.2.5. Be knowledgeable and implement the emergency response plan should it become necessary.

4.2.6. Perform entrant rescue as part of an authorized rescue team if needed.

4.3. Responsibilities of Runner/Equipment Monitors. Runner/Equipment Monitors will:

4.3.1. Monitor all equipment.

4.3.2. Inform shop personnel and other emergency organizations during implementation of the emergency response plan.

4.3.3. Assist attendant if rescue is needed.

4.3.4. Be knowledgeable in implementing the emergency response plan should it be necessary.

4.3.5. Perform entrant rescue as part of an authorized rescue team if needed.

4.3.6. Be qualified to operate and perform calibration on the 514 Combustible Gas Alarm and Oxygen Indicator

5. HAZARDS ASSOCIATED WITH FUEL SYSTEMS MAINTENANCE

5.1. Fire/Explosive Hazard. (Fuel vapor) + (oxygen) + (ignition source) = (explosive atmosphere).

5.1.1. Vapor and oxygen are always present in the repair area. The key is to remove the ignition source. Spark/flame producing items are the obvious, but radios, watches, powered equipment, and static electricity are others.

5.1.2. Ignition sources can be prevented by grounding and bonding equipment and using only explosion proof equipment. Continuous purging of the fuel tank/cells reduces vapor concentra-

tions and eliminates combustible atmospheres. Always avoid dragging or dropping metal objects in the repair area.

5.2. Fuel Hazards.

5.2.1. Avoid breathing fuel vapors. Always use a respirator.

5.2.2. Avoid prolonged exposure to liquid fuel. This will cause dermatitis. Also, the fuel (Benzene) can be absorbed through the skin. Note: Benzene is not an ingredient in JP-8 fuel.

5.3. Oxygen deficient atmospheres. Exposure to an oxygen deficient atmosphere can cause asphyxiation or even death. Oxygen levels shall be maintained between 19.5 and 23.5 percent.

6. OPERATION OF SUPPORT EQUIPMENT

6.1. Air Breathing Systems. Rhine Air Breathing System/Bullard Air Breathing System shall be utilized in accordance with the respirator Operating Instruction (OI). This unit provides breathing air for personnel entering the fuel tank/cells. It must be operating at sufficient speed to provide ample air to all respirators attached to the systems.

6.2. Air Supplied Respirators. 3M Full Face Air Supplied Respirator or Wilson Half Face Respirator will be utilized whenever personnel are in a fuel tank/cell. (See attachment 2 of Master Permit for guidance on what situations warrant forced air or half face respirator). These must have a fit check done prior to use. Personnel are trained for their respirator and the respirator operating instruction is located in the Respiratory Program book #11 in Element Chiefs office.

6.3. Other Equipment. CCU-1 and EU-1 units are operated constantly when purging aircraft fuel tank/cells. The switches for these units are located next to the respirator hoses. They must be on and working prior to and during fuel/cell entry.

7. RESCUE AND EVACUATION PROCEDURES

7.1. Attendants Responsibilities. Refer also to Chapter 8, *Emergency Response Plans and Procedures.*

7.1.1. Once aware of an emergency requiring rescue, he/she will notify the runner/equipment monitor to initiate the emergency response plan and make all attempts at rescue without entry until the rescue team members arrive.

7.1.2. After the runner/equipment monitor returns, don a respirator and enter the fuel tank/cell with additional respirator.

7.1.3. Reach the victim as quickly as possible. Check the victim's condition for breathing and pulse.

7.1.4. Remove victim's original respirator and put the additional respirator on the victim.

7.1.5. Assist the victim out of the tank/cell if conscious. If unconscious, use under-arm-cross-chest drag or any other means possible to extract the individual from the tank/cell. If you cannot remove the person alone, as soon as the fire rescue personnel arrive at the scene, gain assistance from any other qualified personnel to help in the extraction.

7.1.6. After extraction, with help from the runner/equipment monitor, fuel systems personnel, or fire rescue team members, remove victim to a well ventilated area. Perform basic life support (CPR) and any other first aid requirements until medical personnel arrive.

7.1.7. Notify NCOIC of incident and outcome.

7.2. Runner/Equipment Monitors Responsibilities. Refer also to Chapter 8, *Emergency Response Plans and Procedures.*

7.2.1. When notified by the attendant of the emergency, set off the combustible gas alarm to notify others in the immediate area. Then notify all other section personnel anyway possible.

7.2.2. You will notify the following agencies: **NOTE:** For expedience, call the MACC and inform them to notify other agencies.

7.2.2.1. Maintenance Aircraft Coordination Center (MACC) (7-5906, Hotline).

7.2.2.2. Fire Department (911, 7-5215).

7.2.2.3. Hospital Emergency Room (911, 7-5661).

7.2.3. Take attendant's position outside of the tank/cell to assist in extracting the individual.

7.2.4. Ensure unauthorized equipment and personnel are not allowed in the repair area.

7.2.5. After the rescue is completed and the victim is under emergency medical technician's care, temporarily close all fuel tanks.

7.3. Evacuation Procedures. In case of fire, the following procedures will be used:

7.3.1. Notify individual in the fuel tank/cell of the emergency.

7.3.2. Notify all other personnel in the facility.

7.3.3. Activate any one of the fire alarm pull stations.

7.3.4. Assist the individual from the fuel/tank cell.

7.3.5. One person will open the nose dock overhead door and direct fire department.

7.3.6. All personnel will evacuate to the south side of Hangar 1012.

7.3.7. A head count will then be performed.

7.3.8. Assist all responding agencies and give pertinent information. Notify section supervision for up channeling information to squadron key personnel.

7.3.9. If the hangar doors to Hangar 1012 become lodged or stuck during a real world evacuation, a vehicle may be used to assist in moving the hangar doors allowing the aircraft to be removed from Hangar 1012.

7.4. Emergency Notification of Other Organizations. Notify the following agencies:

7.4.1. Fire Department. To notify the Fire Department phone 911 (phones are located in office and right side of nose area), or pull a fire alarm system pull station located throughout hangar.

7.4.2. Hospital Emergency room. Phone 911 or 7-5387.

7.4.3. Maintenance Aircraft Coordination Center. Phone the hotline, 7-5906. If all else fails, use a radio or any other means to contact the MACC. They will contact the other agencies.

8. EMERGENCY RESPONSE PLANS AND PROCEDURES

8.1. Primary Rescue Team. The primary rescue team will be the attendant and the runner/equipment monitor. The attendant or the runner/equipment monitor for initial attempts at rescue follows these procedures:

8.1.1. Prior to any tank entry for removal of an incapacitated entrant:

8.1.1.1. The attendant will:

8.1.1.1.1. Alert the runner.

8.1.1.1.2. Ensure proper tank/cell ventilation.

8.1.1.1.3. Find out extent of emergency from entrant if possible.

8.1.1.1.4. Assess the condition of the tank/cell and make every attempt to rescue the victim without entering the tank until the rescue team arrives. Prepare for entry if you are a member of the rescue team.

8.1.1.2. The runner will:

8.1.1.2.1. Sound the alarm system by quickest method and initiate contact with emergency response activities.

8.1.1.2.2. Alert personnel in office of an emergency.

8.1.1.2.3. Ensure the hospital Emergency Room (911, 7-5661), Maintenance Aircraft Coordination Center (7-5906, Hotline), and Fire Department (911, 7-5215) are notified. **NOTE:** Can also activate one of the fire alarm system pull stations located in the office, hangar exits, and west mezzanine.

8.1.1.2.4. Take position of the attendant until entrant person has been removed. **NOTE:** In this case, the runner must be trained and capable to perform the duties of the attendant. (Ref: T.O. 1-1-3, para 2-8.3)

8.2. Responsibilities of the attendant and runner when rescuing entrant .

8.2.1. Attendant will don supplied air respirator and enter tank with an additional respirator.

8.2.2. Attendant will not enter the tank until the runner assumes the duty of the attendant.

8.2.3. Reach the victim as quickly as possible and check for breathing. Inform attendant/runner at access door.

8.2.4. Whether or not entrant is breathing, place a new respirator on the entrant.

8.2.5. Assist entrant out of tank/cell. If entrant is unconscious, grasp under arms and pull entrant out by most direct route.

8.2.6. Get entrant to a well ventilated area.

8.2.7. Emergency revival techniques should be used on an unconscious victim as soon as possible by a person who is qualified to provide emergency treatment until qualified medical personnel arrive.

8.2.8. Attendants or runners designated for initial removal will be trained in CPR, Self-Aid and Buddy Care or equivalent.

8.2.9. If the runner is designated for removal, the attendant will not leave the tank/cell area once the runner has entered.

8.3. Emergency Response Plan Items. The emergency response plan will list equipment and facility requirements necessary to safely remove an incapacitated entrant.

8.3.1. Dock installed purging system (CCU-1EU-2)

8.3.2. Dock installed breathing air system (breathing pumps and respirators). If breathing air is suspect, utilize alternate breathing source located in dock area. Ensure the ambient breathing pumps air inlet source is located in an area where the air is not subject to contamination.

8.3.3. Dock installed emergency showers/eyewash systems.

8.3.4. Dock installed telephone system.

8.3.5. Explosion-proof drop lights and flashlights.

8.3.6. Voice activated communication system.

8.3.7. One rescue vehicle with an assigned crew of three, and one pumper vehicle with an assigned crew of four will be utilized by the Fire Department.

8.3.8. One each ambulance with all required advanced life support equipment and two Emergency Medical Technicians (EMT) and MD or RN will be utilized by Emergency Medical Services.

8.4. Other Organizations Responsibilities. The roles and activities of all responding emergency agencies, including rescue from a tank/cell when efforts of the attendant or runner have failed.

8.4.1. The Fire Department will provide rescue assistance without tank entry.

8.4.2. Emergency Medical Service's roles: Two each EMTs and/or MD/RN will provide advanced life support to accident victim when removed to a safe location determined by fire department personnel and transport to the appropriate medical care facility.

8.5. Rescue Capability. Rescue capability must exist for all shifts during which tank/cell entry is accomplished. The size of the rescue teams must be sufficient in size to prevent unattended rescues attempts from being performed unless all team members from responding agencies are present.

8.6. Toxicity Level Standards. Although the most likely rescue will be from a non-immediately dangerous to life or health (IDLH) environment, the plan will account for rescue from an IDLH atmosphere as defined. For rescue purposes only, the IDLH is a Lower Explosive Level (LEL) greater than 20 percent, oxygen content of 16 percent of less or greater than 23.5 percent. A toxicity level exceeding established standards for any known chemical agents used in the tank/cell or any local Bio-environmental agencies IAW T.O. 1-1-3 para 2-8.4.1.A.1. under no circumstances will anyone enter an IDLH atmosphere for any reason.

8.7. Response Plan Exercises. The emergency response plan will be exercised at least once every year. At this time, the rescue will practice making removals from actual or simulated fuel tanks/cells. Use of dummies of mannequins is authorized and should be utilized. The emergency response plan exercise log will be maintained in Element Chief's bookshelf, book 18, tab H. An exercise log will be maintained documenting the following:

8.7.1. Date of exercise.

8.7.2. Scenario.

8.7.3. Outcome.

8.7.4. Lessons learned.

8.7.5. Participants.

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Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

References

T.O. 1-1-3, *Inspection and Repair of Aircraft Integral Tanks and Fuel Cells,* 30 Nov 94.

Terms

Attendant—A trained individual outside the confined space who acts as the observer of the entrant and maintains direct communication with the entrant.

Entrant—Any employee who is trained and authorized to enter a fuel tank/confined space for purpose of repair, inspection or rescue.

Entry—Any act which results in any part of the employee's face breaking the place of the opening of the fuel tank/confined space. Includes any ensuring work in the fuel tank/confined space.

Entry Safe—Conditions at which the atmosphere inside a de-fueled tank/cell is 10 percent lower explosive limits (LEL) or lower as measured by an approved combustible vapor detector, oxygen content is between 19.5 and 23.5 percent as measured by an approved oxygen indicator, and toxicity levels are within the limits prescribed by the Master Permit.

Immediately Dangerous to Life or Health (IDLH)—Any condition that poses immediate threat to life or which is likely to result in acute or immediate severe health effects. For rescue purposes IDLH level is 20% LEL greater, or oxygen content less than 16% or greater than 23.5%.

Rescue Team—A group of two or more specially trained employees (preferable fuel systems repair specialist, AFSC 2A6X4 or equal) who are designated to rescue entrants from fuel tank/confined space.

Runner/Equipment Monitor—A person who acts as equipment monitor and runner in case of emergencies. May be designated as a rescue team member they must be qualified to perform as an attendant.